REMARKS

Applicant acknowledges with appreciation the courtesy of the telephone interviews extended the undersigned attorney by Examiner Hendrickson, the Examiner in charge of this application. During these interviews, the undersigned attorney noted that the Official Action indicated that the recycling aspect of the invention was not presented in claim 5 but was present in claim 6. Accordingly, in an effort to place the application in early condition for allowance, Applicant has amended claim 5 to include the recycling step which is basically that present in claim 6 and as appreciated by the Examiner. It is most respectfully submitted that this Amendment does not create a new issue and therefore it is requested that the present Amendment be entered. The claims are now clearly commensurate in scope with the arguments presented.

The rejection of claims 5-9, 16 and 18 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been carefully considered but is most respectfully traversed. Claim 5 has been amended to include recycling thereby obviating this aspect of the rejection. The word "fine" has been deleted from claim 9 and the Examiner's suggestion for amending claim 9 has been followed in that being crushed is now used in the claim as noted by the Examiner. Accordingly, it is most respectfully requested that this aspect of the rejection be withdrawn.

Applicant has not amended claim 18 as it is believed that the term "down to" would be clear to one of ordinary skill in the art to which the invention pertains in light of the present specification. Clearly, one of ordinary skill in the art would appreciate that the temperature does not include a process which is lower than 400°C.

As noted on page 3 of Applicant's specification, the present invention makes it possible to produce a much more compact system compared to systems with moving particles or carbon deposition on surfaces. In addition, the new method is significantly more energy effective because the pyrolysis process operates at temperatures down to 400°C. One of ordinary skill in the art would appreciate that this is a lower limit of

claim 18. Accordingly, it is most respectfully requested that the rejection of the claims under 35 U.S.C. 112 be withdrawn.

The rejection of claims 5, 8 and 18 under 35 U.S.C. 102 as anticipated by Voet et al. has been carefully considered but is most respectfully traversed in view of the amendment to the claim 5 in adding the recycling step to claim 5 as noted by the Examiner on page 3 of the Official Action. Accordingly, it is most respectfully requested that his rejection be withdrawn.

Applicant notes that the Examiner has properly appreciated the claimed invention. The invention resides in pyrolysing an organic gas by passing it through the heated reaction chamber and recycling it so that the gas passes through the chamber many times. Recycling is a claim limitation in all of the claims which cannot be ignored and clearly distinguishes the claim invention over the teachings of the Voet et al. reference.

The principal amendment is to claim 5 to make clear that the method includes the step of recycling the gas back through the reaction chamber. It is this gas recycling which is a key distinction over both Voet et al. and DD 118263. It is contended that by clearly reciting this limitation not only should the indefiniteness objection be overcome, but the Examiner should heed the arguments previously put forward in the response filed in January this year as to why neither document teaches nor suggests recycling. It is this gas recycling which gives the compactness and high efficiency which are the hallmarks of Applicant's invention.

Applicant most respectfully submits that the claimed invention is not obvious to one of ordinary skill in the art in view of Voet et al. As just noted the presently claimed invention resides in pyrolysing an organic gas by passing it through the heated reaction chamber and recycling it so that the gas passes through the chamber many times. This allows the catalytic carbon dust particles to grow significantly to a size where they can be mechanically trapped and therefore retrieved from the reaction. It also means that a hydrogen-rich stream may be extracted from the input organic gas.

Furthermore, the efficient pyrolysis and hydrogen/carbon production achievable in accordance with the invention means that the reaction chamber does not need to be heated to 1000°C or more but may be operated at a temperature down to 400°C (see claim 18) which brings the operating range into the realm of waste heat from other processes rather than requiring specialized heating.

The Voet et al. article makes no suggestion whatsoever of recycling the gases nor of the desire efficiently to produce large amounts of hydrogen and carbon. Indeed, this would not appear to be achievable in accordance with the Voet teaching, and, in any event, it does not have the advantage that the process may be run at significantly lower temperatures than 1000°C and therefore utilize waste heat form other ordinary processes. None of this is mentioned or suggested by Voet et al. which relates to the determination of pore sizes and pore size distribution of carbon blacks by the t curve procedure wherein it is said that exposure of carbon blacks to methane at 1050degrees C must lead to pore filling but there is no suggestion of the presently claimed process, including precipitation and recycling of the carbon black particles in accordance with the present invention. The invention as claimed is therefore considered to be both novel and unobvious over Voet et al and it is most respectfully requested that these rejections be withdrawn.

The rejection of claims 5-9 and 16 and 18 under 35 U.S.C. 103 as being unpatentable over DD 118263 A1 (hereinafter the '263 reference) has been carefully considered but is most respectfully traversed for the reasons set forth in the discussion of this reference on pages two and three of Applicant's specification and the following comments.

Applicant wishes to direct the Examiner's attention to the basic requirements of a prima facie case of obviousness as set forth in the MPEP § 2143. This section states that to establish a prima facie case of obviousness, three basic criteria first must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable

expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Section 2143.03 states that all claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

In the Official Action it is urged the reference teaches in Example 1 heating carbon particles by heat exchange from another process then depositing carbon on them from the decomposition of a hydrocarbon. The product can be milled and recycled. The Official Action acknowledges that the reference does not teach powder. However, using a powder therein is said to be an obvious expedient to provide a carbon source on which deposition can occur and which is fine enough to have a sufficient residence time for the reaction but does not provide any reason in support of this position which clearly relies upon impermissible hindsight. In re Fritch, 23 USPQ 1780, 1784(Fed Cir. 1992) ("It is impermissible to engage in hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps.).

Applicant wishes to note that Applicant's comments with respect to Voet et al as noted above, apply to the '263 reference. This reference discloses a pyrolysis process in which carbon particles are heated to a temperature in excess of 1000°C before being injected into a hydrocarbon gas within a relative large reaction chamber. The transit time of the carbon particles through the reaction chamber is very short in such an arrangement and there is, therefore, little opportunity for the carbon particles to grow in

size. Furthermore, the relatively low rate of pyrolysis means that no hydrogen-rich gas stream is produced.

By contrast, the present invention involves heating the reaction chamber in which the carbon dust resides and further recites a recycling loop rather than the in-line arrangement taught in the '263 reference. In accordance with the invention, both carbon and hydrogen may be produced from the hydrocarbon fuel thus extending the range of possible uses and commercial potential of the system. The invention allows a much higher rate of pyrolysis as the amount of active carbon per unit volume may be orders of magnitude higher. Accordingly, it is most respectfully requested that this rejection be withdrawn.

Applicant notes that the inventor's given name is Arild and family name is VIK as noted in the request for corrected filing receipt filed on January 5, 2004.

In view of the above comments and further amendments to the claims, favorable reconsideration and allowance of all of the claims now present in the application are most respectfully requested.

Respectfully submitted,

BACON & THOMAS, PLLC

By: Richard E. Fichter
Richard E. Fichter
Registration No. 26,382

625 Slaters Lane, 4th Fl.
Alexandria, Virginia 22314
Phone: (703) 683-0500
Facsimile: (703) 683-1080

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